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Broccoli and
Cauliflower
Trials 1995
and Three-year
Compendium

BY DAVID E. HILL

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In 1995, 11 cultivars of broccoli and 10 cultivars of cauliflower were grown at Windsor on a sandy terrace soil and at Mt. Carmel on a loamy upland soil. For spring harvest, two crops were planted in late-April and mid-May. For fall harvest, three crops were planted in mid-July, early-August, and mid-August. In spring crops, average yield of broccoli ranged between 12,325-12,685 lb/A at Windsor and 8,565-10,030 lb/A at Mt. Carmel. In fall crops, average yield of broccoli ranged between 10,370-11,720 lb/A at Windsor and 15,070-16,265 lb/A at Mt. Carmel. Lower average yield in the sandy soil at Windsor was due to development of corky stem, a symptom of boron deficiency. In spring, yield at both sites of Arcadia, Eureka, and Everest exceeded the 1993 national average of 10,100 lb/A and were of excellent quality. In fall, yield at both sites of Arcadia, Eureka, Everest, Pinnacle, Mariner, Olympus, Regal, and Republic exceeded the national average and were of excellent quality. Everest and Regal, early maturing cultivars, maintained satisfactory yield and quality when planted in mid-August.

In spring crops, the average yield of cauliflower ranged between 11,000-14,670 lb/A at Windsor and 5,790-8,500 lb/A at Mt. Carmel. Lower yield at Mt. Carmel was related to soil moisture deficits in June and July. In fall, the average yield of cauliflower ranged between 17,730-18,715 lb/A at Windsor and 14,890-27,075 lb/A at Mt. Carmel. In spring, yield at both sites of Fremont and Minuteman exceeded the 1993 national average of 12,100 lb/A and had excellent quality. In fall, yield at both sites of Fremont, Minuteman, Incline, Rushmore, and Siria exceeded the national average. These cultivars were of excellent quality with tightly wrapped inner leaves that ensured blanching of the curds.

Days to maturity and harvest spans were determined for all cultivars in successional plantings to allow growers to estimate approximate harvest dates for cultivars grown in spring and fall plantings. Cultivars with short harvest spans were selected for single harvests by hand or machine or long harvest spans to maintain daily supply for roadside markets.

Management strategies and a 3-year compendium of 1993-1995 trials are presented.

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Broccoli and Cauliflower Trials 1995 and Three-Year Compendium

BY DAVID E. HILL

The American Medical Association and nutritionists have extolled the virtues of members of the genus *Brassica* as important components of human diet. Their high sulforaphane content has been identified as an anti-cancer agent. Consumers have responded by increasing their annual consumption of broccoli from 0.5 lb in 1970 to 3.1 lb in 1994 (Karst 1994). These numbers do not include consumption of home-grown broccoli. The area devoted to broccoli in the United States increased from 77,850 acres in 1980 to 107,200 acres in 1993, a 38% increase (USDA 1994). During the same period, cauliflower increased from 43,320 acres to 55,600 acres, a 28% increase.

Production in Connecticut

Broccoli and cauliflower have been mostly grown for local consumption by direct marketing through roadside sales from late-June through early October. In 1982, 41 acres of broccoli and 117 acres of cauliflower were grown in Connecticut (Stephens 1988). In 1985, the "Broccoli Project" was established by the Connecticut Department of Agriculture to enlist growers of broccoli to supply two supermarket chains who agreed to sell Connecticut-grown produce. By 1988, broccoli acreage increased to over 100 acres (Hill 1989). The Connecticut Agricultural Experiment Station's role in the Project was testing cultivars (cultivated varieties) to determine those best suited to Connecticut's soil and climate. From 1985 to 1988, 48 cultivars of broccoli and 41 cultivars of cauliflower were tested (Hill 1986, 1987, 1988, 1989). The trials determined yield and quality for spring and fall production.

Current outlook

The foodservice industry, encompassing fast-food chains, restaurants, school and corporate cafeterias, and hospitals has rapidly grown to a \$123 billion dollar giant. This industry purchases about 30% of all produce grown in the United States and 70% of all prepared fresh cut items (salad mixes, baby peeled carrots, broccoli and cauliflower florettes, etc.) (Anon 1995). This burgeoning growth is fueled by consumers who now spend 40% of their food dollars away from home (Anon 1996). Although sales of whole heads of broccoli and cauliflower remain dominant, sales of fresh-cut produce have greatly increased. Fresh-cut broccoli

and cauliflower (pared, peeled, sliced and diced) can now be purchased as crown cuts (without stalks) or as loose or packaged florettes and the stalks reduced to coins, and sticks for party snacks and slaw for salads.

Since completion of broccoli and cauliflower trials in 1988, plant breeders have developed new cultivars of broccoli that alter the shape of the head, ease harvesting and trimming, and provide disease resistance. Since 1988, seed companies have released at least 27 new cultivars of broccoli and 30 new cultivars of cauliflower.

In this bulletin, I report yield, quality, and maturity of 11 cultivars of broccoli (six released in 1995) and 10 cultivars of cauliflower (six released in 1995) grown at Windsor and Mt. Carmel in two spring plantings and three fall plantings. I will also discuss management strategies to maximize yield through cultivar selection and planting dates. Finally, I will present a 3-year compendium of yield for all cultivars grown at both sites and list cultivars and their characteristics that captured my attention during the trials.

METHODS AND MATERIALS

Soils

The broccoli and cauliflower trials were conducted at the Valley Laboratory, Windsor on a Merrimac sandy loam, a sandy terrace soil with somewhat limited moisture holding capacity, and at Lockwood Farm, Mt. Carmel (Hamden) on a Cheshire fine sandy loam with moderate moisture holding capacity (spring crops, and fall crop 2) and Watchaug loam, a moderately well drained soil with moderate moisture holding capacity (fall crops 1 and 3).

Cultivars

Seeds were obtained from several domestic suppliers. Eleven cultivars of broccoli and 10 cultivars of cauliflower were grown in 1995 (Table 1). The array of cultivars in 1995 includes six cultivars of broccoli and six cultivars of cauliflower tested for the first time. Most of these are new releases.

Culture

Details of management of soils and crops and pertinent dates are listed in Table 2.

Table 1. Broccoli and cauliflower cultivars grown at Windsor and Mt. Carmel, 1995.

Cultivar	Maturity	Years Grown
BROCCOLI		
Arcadia	Late	3
Eureka	Late	3
Everest	Main Season	3
Legacy	Late	1
Liberty	Main Season	1
Mariner	Early	3
Olympus	Early	1
Pinnacle	Late	3
Regal	Early	1
Republic	Main Season	1
Superior	Main Season	1
CAULIFLOWER		
Fremont	Main Season	2
Incline	Late	2
Majestic	Early	1
Minuteman	Main Season	1
Rushmore	Main Season	2
Siria	Main Season	2
Starbrite Y	Main Season	1
Star Dust	Late	1
White Passion	Early	1
Yukon	Main Season	1

Seeds for the first and second spring plantings were sown 2 weeks apart in a greenhouse maintained at 50-70F. Four-week old seedlings were moved to a cold frame for hardening about 10 days before they were transplanted in the field. Seeds for the fall crops were sown outdoors at 2-week intervals in a cold frame. Three fall crops were grown in 1995.

The seedlings were grown in Promix BX in standard plastic pots (2 5/8 x 2 1/4 x 2 5/16 inches) held in packs of 36. Water soluble 20-20-20 fertilizer (1 tbsp/gal) was added to the seedlings 1 week before transplanting.

The seedlings were transplanted in rows 36 inches apart with 18-inch spacing within rows (equivalent to 9680 plants/acre). Each planting consisted of five randomized blocks with six plants per cultivar in each replication. Transplants that died within the first week were replaced.

Preplant fertilization with 10-10-10 in the sandy soil at Windsor (1000 lb/A) was less than the application at Mt. Carmel (1300 lb/A) to avoid initial leaching of nutrients to ground water. Sidedressing with calcium nitrate at Windsor (two applications) and ammonium nitrate at Mt. Carmel (one application) supplied the crops with adequate nutrients.

In spring, leaves of cauliflower were tied around the developing curds of all cultivars except those with tightly

furled wrapper leaves when they reached about 2 inches diameter. In fall, most plants producing 2-inch curds before October 1 were tied. After October 1, leaves were not tied because either the inner leaves remained tightly furled around the curd or the outer leaves were tall enough to protect the curds from direct sunlight.

Harvest

Mature heads of broccoli and cauliflower were harvested at 3 or 4-day intervals. Broccoli heads were weighed and quality judged for color, evenness and compactness of the head, excessive stalk size, and presence of leaves protruding from the head. Cauliflower curds were weighed and quality judged for color, smoothness of the curd, and protection by inner wrapper leaves.

Rainfall

Rainfall distribution throughout the growing season, May-October, is shown in Figure 1. Each bar represents the departure from the mean monthly rainfall for Hartford and Mt. Carmel reported by the National Weather Service. In 1995, the total rainfall during May-October was 23.4 inches at Windsor and 23.7 inches at Mt. Carmel, compared to 30-year averages of 19.1 and 19.6 inches, respectively, at each site. Although total rainfall at Windsor and Mt. Carmel was 4.4 and 3.8 inches above average, respectively, water deficits occurred in 3 of 5 months from May-September, accounting for a water shortage of 2.2 inches at both sites during that period. In October, heavy rains, exceeding 9.0 inches at both sites, erased the water deficit for the growing season. Water deficits from May-September were somewhat alleviated by irrigation.

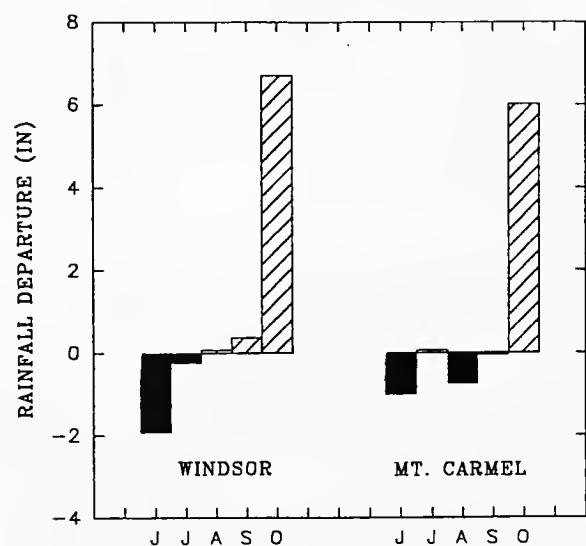


Figure 1. Departure from normal rainfall (0) during the 1995 growing season at Windsor and Mt. Carmel.

YIELD AND QUALITY OF BROCCOLI

Spring crops

In the first spring crop (transplanted late-April), the average yield of 11 cultivars was 12,680 lb/A at Windsor and 10,030 lb/A at Mt. Carmel, a 26% difference (Table 3). The lower average yield at Mt. Carmel was largely due to lower average head weight (1.1 lb vs. 1.2 lb). Heads of early maturing cultivars, Mariner, Olympus, Regal, and Superior were very small at Mt. Carmel because of premature head development (buttoning). At Windsor and Mt. Carmel, the yield of 7 of 11 cultivars exceeded the 1993 national average of 10,100 lb/A (USDA 1994).

At Windsor, Legacy, a late-maturing cultivar, had the greatest yield but the individual florettes within the head

grew unevenly creating a lumpy appearance. Yield of Arcadia, Eureka, and Pinnacle exceeded 16,000 lb/A. The quality of Eureka was excellent with dome-shaped heads rising above the leaf canopy for easy harvest. The quality of Pinnacle was fair with somewhat lumpy heads. Arcadia had well formed heads but some stalks had a corky appearance (corky stem, a symptom of boron deficiency). Everest displayed the best quality among all cultivars but the medium sized heads (1.1-1.2 lb) reduced yield.

At Mt. Carmel, yield of Eureka and Liberty exceeded 16,000 lb/A. The quality of Eureka was good but some late maturing plants displayed uneven head growth. The quality of Liberty was fair with uneven growth in about 50% of the heads. The stalks of Liberty were short and very thick. The yield of Arcadia and Everest exceeded the national average

Table 2. Soil and crop management of broccoli and cauliflower and pertinent data, 1995.

ACTIVITY		Spring Crops	Fall Crops
<i>Soil fertilization (rates based on soil tests)</i>			
WINDSOR			
10-10-10		1000 lb/A	1000 lb/A
Calcium nitrate			
(sidedress 3 & 5 weeks after transplanting)		175 lb/A ea	175 lb/A ea
MT. CARMEL			
10-10-10		1300 lb/A	1300 lb/A
Ammonium nitrate			
(sidedress 1 month after transplanting)		90 lb/A	90 lb/A
Lime (to attain pH 6.5)		None	None
<i>Planting dates</i>			
Seeding in greenhouse or cold frame	Crop 1	March 15	June 16
	Crop 2	March 27	June 30
	Crop 3	—	Aug 13
Transfer to cold frame	Crop 1	April 12	—
	Crop 2	April 29	—
Transplant seedlings to field	Crop 1	April 26-30	July 17-19
	Crop 2	May 15-17	Aug 3-4
	Crop 3	—	Aug 25
<i>Pest control</i>			
Root maggots	Lorsban 4E		
Cabbage worms, aphids*	Asana XL		
Flea beetles*	Sevin		
Downy mildew*	Bravo 500		
<i>Number of irrigations</i>			
Windsor		2	5
Mt. Carmel		3	3

*As needed

Table 3. Yield of broccoli at Windsor and Mt. Carmel, Spring 1995.

Cultivar	WINDSOR			MT. CARMEL		
	Heads Hvst. %	Avg. Head ^X lb	Total Yield ^{XY} lb/A	Heads Hvst. %	Avg. Head ^X lb	Total Yield ^{XY} lb/A
FIRST CROP						
Arcadia	97	1.7ab	16,245b	97	1.6ab	15,025a
Eureka	100	1.8ab	17,035b	97	1.7a	16,055a
Everest	100	1.1bc	10,260bc	97	1.2b	11,360b
Legacy	100	2.2a	21,100a	83	1.8a	14,140ab
Liberty	100	1.6b	15,295ab	100	1.7a	16,360a
Mariner	93	0.6c	5,760c	100	0.2c	2,035c
Olympus	100	0.8c	7,745c	100	0.3c	2,805c
Pinnacle	100	1.7ab	16,455ab	97	1.2b	11,175b
Regal	97	0.7c	6,665c	93	0.3c	3,060c
Republic	100	1.4b	13,165bc	97	1.4ab	13,145ab
Superior	100	1.0bc	9,775bc	97	0.6c	5,165c
SECOND CROP						
Arcadia	87	1.6b	13,220ab	80	1.3b	9,755ab
Eureka	100	1.5b	14,230a	93	1.2b	10,625ab
Everest	90	1.6b	14,290a	80	1.2b	9,295ab
Legacy	63	2.2a	13,355ab	37	2.1a	7,665b
Liberty	100	1.7ab	16,165a	93	1.3b	11,705a
Mariner	100	1.0bc	10,065b	100	0.6c	6,195c
Olympus	93	0.8c	7,380c	90	0.6c	4,790c
Pinnacle	93	1.3b	11,885ab	70	1.1b	7,180b
Regal	97	0.8c	7,700c	90	0.6c	5,140c
Republic	97	1.4b	13,615ab	97	1.3b	12,395a
Superior	97	1.5b	13,990ab	97	1.0bc	9,485ab

^XMean separation within columns by Tukey's HSD multiple comparison test at P = 0.05. Values in columns followed by the same letter within each crop did not differ significantly.

^YBased on 9680 plants/A x avg. head wt. x % harvested.

and their quality was excellent. Mariner, Olympus, and Regal produced very small heads due to premature development.

In the second spring crop (transplanted mid-May), the average yield of 11 cultivars was 12,355 lb/A at Windsor and 8,565 lb/A at Mt. Carmel, a 44% difference. Low average yield at Mt. Carmel was attributed to droughty conditions and deer browse which damaged up to 20% of some cultivars. At Windsor, yield of eight of 11 cultivars exceeded the national average and three of 11 at Mt. Carmel.

At Windsor, Liberty had the greatest yield but quality was reduced by browning of individual flower buds (brown beading) and very thick stalks. Yield of Everest and Eureka

exceeded 14,000 lb/A and quality was excellent. The quality of Arcadia was good with some stalks developing corky stem. Olympus and Regal developed small to medium sized heads due to early maturation. Their quality was good but their heads would require bunching for commercial sales.

At Mt Carmel, yield of Republic and Liberty exceeded 11,700 lb/A but their quality was fair because of a lumpy appearance. Although yield of Everest was below the national average, the 1.2 lb-heads displayed excellent quality. The heads were semi-domed and well exerted above the leaf canopy for easy harvest. Everest lacked buds in the leaf axils which precluded development of secondary sprouts for subsequent harvest.

Table 4. Yield of broccoli at Windsor and Mt. Carmel, Fall 1995.

Cultivar	WINDSOR			MT. CARMEL		
	Heads Hvst. %	Avg. Head ^X lb	Total Yield ^{XY} lb/A	Heads Hvst. %	Avg. Head ^X lb	Total Yield ^{XY} lb/A
FIRST CROP						
Arcadia	90	1.2b	10,630b	90	1.6bc	14,290bc
Eureka	97	1.1b	10,235b	100	1.5c	14,230b
Everest	90	1.2b	10,020b	97	1.8b	16,715b
Legacy	93	1.9a	16,925a	93	2.4a	21,695a
Liberty	93	1.6ab	14,045ab	93	2.1ab	18,815ab
Mariner	87	1.2b	9,855b	97	1.5c	13,395c
Olympus	87	1.3b	10,695b	100	1.8b	17,620ab
Pinnacle	93	1.3b	11,435b	97	1.6bc	14,650b
Regal	93	1.1b	9,905b	93	1.5c	13,595c
Republic	97	1.6ab	14,650ab	100	2.0ab	19,070a
Superior	97	1.2b	10,515b	97	1.5c	14,365bc
SECOND CROP						
Arcadia	93	1.0a	9,090b	97	1.6ab	14,930ab
Eureka	93	1.1a	10,085ab	93	1.7ab	14,945ab
Everest	90	1.2a	10,890ab	90	1.4b	11,850bc
Legacy	97	1.4a	13,145a	93	1.9a	17,285a
Liberty	90	1.3a	11,065ab	100	1.9a	18,390a
Mariner	97	1.2a	11,270ab	100	1.4b	13,550b
Olympus	87	1.3a	10,780ab	100	1.6ab	15,390ab
Pinnacle	93	1.1a	9,540b	90	1.5ab	13,240b
Regal	93	1.0a	9,360b	-	-	-
Republic	83	1.4a	10,925ab	97	1.9a	18,120a
Superior	83	0.9a	7,550c	100	1.3b	12,970bc
THIRD CROP						
Everest	90	1.0a	8,540ab	67	1.5a	9,535a
Mariner	-	-	-	77	1.1ab	8,425ab
Olympus	67	1.0a	6,290ab	57	1.1ab	5,960ab
Regal	83	1.1a	9,000a	70	1.2ab	8,200ab
Republic	47	1.0a	4,415b	53	1.0ab	4,975b
Superior	57	0.7a	4,030b	73	0.9b	6,500ab

^XMean separation within columns by Tukey's HSD multiple comparison test at P = 0.05. Values in columns followed by the same letter within each crop did not differ significantly.

^YBased on 9680 plants/A x avg. head wt. x % harvested.

Table 5. Yield of cauliflower at Windsor and Mt. Carmel, Spring 1995.

Cultivar	WINDSOR			MT. CARMEL		
	Curds Hvst. %	Avg. Curd ^x lb	Total Yield ^{xy} lb/A	Curds Hvst. %	Avg. Curd ^x lb	Total Yield ^{xy} lb/A
FIRST CROP						
Fremont	90	1.9a	16,900a	90	1.1ab	9,670ab
Incline	97	1.7a	16,150a	80	0.9b	7,280b
Majestic	97	0.6b	5,350b	97	0.3c	3,190c
Siria	80	1.7a	13,320ab	87	1.2ab	9,685ab
Starbrite Y	97	1.7a	16,150a	93	1.2ab	11,075a
Star Dust	90	1.9a	16,640a	70	1.4a	9,350ab
White Passion	97	1.6a	15,210a	90	1.2ab	10,105a
Yukon	93	2.0a	17,645a	67	1.2ab	7,655b
SECOND CROP						
Fremont	93	1.6a	14,675a	83	1.0ab	8,435a
Incline	70	0.9b	6,370c	37	0.8bc	2,795c
Majestic	100	0.7b	6,775c	80	0.4c	3,330c
Minuteman	87	1.6a	13,220a	67	1.3a	8,170a
Rushmore	83	1.6a	12,935ab	83	1.1ab	8,920a
Siria	87	1.6a	13,055a	77	1.0ab	7,825ab
Starbrite Y	90	1.6a	13,590a	93	1.1ab	9,990a
Star Dust	97	1.0b	9,575b	43	0.8bc	3,120c
White Passion	97	1.1b	10,515b	97	1.0ab	9,110a
Yukon	87	1.1b	9,265b	73	0.7bc	5,230b

^xMean separation within columns by Tukey's HSD multiple comparison test at $P = 0.05$. Values in columns followed by the same letter within each crop did not differ significantly.

^yBased on 9680 plants/A x avg. curd wt. x % harvested.

Fall crops

In the first fall crop (transplanted mid-July) the average yield of 11 cultivars was 11,720 lb/A at Windsor compared to 16,265 lb/A at Mt. Carmel, a 39% difference (Table 4). Greater average yield at Mt. Carmel was due to heavier average head weight (1.8 lb vs. 1.3 lb) and greater average percent harvested (96 vs. 92). Smaller and fewer heads harvested at Windsor were due to the development of corky stem, a symptom of boron deficiency, in many cultivars. The symptoms were less developed in Legacy, Olympus, and Republic. Despite corky stem at Windsor, the yield of eight of 11 cultivars exceeded the national average. At Mt. Carmel, all cultivars exceeded the national average.

At Windsor, yield of Legacy, Liberty and Republic exceeded 14,000 lb/A. These cultivars had large, well-formed, domed heads and thick stalks which contributed to their heavy weight. Corky stem reduced their overall quality to

fair; however, a harvest cut 1 inch below the head (crown cut) eliminated the unsightly stalk and improved quality. Among all cultivars, Olympus had the best quality and the least corky stem.

At Mt. Carmel, yield of Legacy, Liberty and Republic exceeded 18,800 lb/A. Their domed heads were 8-10 inches diameter, averaged more than 2.0 lb, and were supported by thick stalks. Their quality was good to excellent. Liberty and Republic had fewer leaves to trim from a 4-5-inch cut of stalk than Legacy. Excellent quality was also displayed by Arcadia, Eureka, Mariner, Olympus, and Regal whose domed, well exerted heads averaged more than 1.5 lb.

In the second fall crop (transplanted early-August), the average yield of 10 cultivars was 10,335 lb/A at Windsor compared to 15,030 lb/A at Mt. Carmel, a 45% difference. The greater average yield at Mt. Carmel was due to greater average weight of heads (1.6 lb vs. 1.1 lb) and greater aver-

Table 6. Yield of cauliflower at Windsor and Mt. Carmel, Fall 1995.

Cultivar	WINDSOR			MT. CARMEL		
	Curds Hvst. %	Avg. Curd ^x lb	Total Yield ^{xy} lb/A	Curds Hvst. %	Avg. Curd ^x lb	Total Yield ^{xy} lb/A
FIRST CROP						
Fremont	100	2.1b	20,520a	93	3.1a	27,815ab
Incline	77	2.6a	19,155ab	87	2.9ab	24,760b
Majestic	73	1.5c	10,600c	100	2.5b	24,585b
Minuteman	83	2.4a	19,200ab	90	3.4a	29,620a
Rushmore	93	2.2ab	19,445ab	93	3.0a	27,095ab
Siria	83	2.4a	19,365ab	100	2.6b	25,650b
Starbrite Y	93	2.1b	18,635b	100	2.9ab	28,070a
Star Dust	97	2.2ab	20,280a	100	2.9ab	27,685ab
White Passion	97	2.3ab	21,315a	97	3.0a	27,795ab
Yukon	93	2.1b	18,635b	100	2.9ab	27,685ab
SECOND CROP						
Fremont	93	2.0b	18,455ab	93	2.0ab	18,185ab
Incline	90	1.8bc	16,030b	93	1.0d	8,550d
Majestic	77	1.6c	11,555c	100	1.7bc	16,845b
Minuteman	80	2.7a	20,830a	100	2.3a	22,165a
Rushmore	93	2.4a	21,335a	97	1.7bc	15,960b
Siria	87	2.2ab	18,530ab	67	1.9b	12,065c
Starbrite Y	93	2.1b	18,905ab	60	2.5a	14,345bc
Star Dust	90	1.8bc	15,335b	80	1.7bc	12,855c
White Passion	93	2.2ab	19,985ab	73	2.3a	15,970b
Yukon	63	1.9bc	11,405c	90	1.4cd	11,935c
THIRD CROP						
Majestic	80	1.1	8,675	37	1.9	6,700

^xMean separation within columns by Tukey's HSD multiple comparison test at P = 0.05. Values in columns followed by the same letter within each crop did not differ significantly.

^yBased on 9680 plants/A x avg. curd wt. x % harvested.

age percent harvested (96 vs. 91). Although corky stem was less severe in the second crop at Windsor, its presence affected the size of plants and yield. Yield of six of 11 cultivars at Windsor and all cultivars at Mt. Carmel exceeded the national average.

At Windsor, Legacy had the greatest yield but its quality was fair due to uneven head growth. The quality of Everest was excellent with well-formed, semi-domed heads. The quality of the medium-sized heads of Arcadia, Eureka, Pinnacle, and Regal was good. About half of their heads had corky stem but were suitable for crown cuts at harvest.

At Mt. Carmel, the yield of Liberty, Legacy, and Repub-

lic exceeded 17,200 lb/A. Their domed heads averaged more than 1.9 lb and were of good quality. Their thick stalks contributed to their weight and yield. Although yields were less, the quality of Arcadia, Eureka, Everest, Mariner, Olympus, and Pinnacle was excellent with well-formed, semi-domed or domed heads.

In the third fall crop (transplanted mid-August), average yield of five cultivars was 7,265 lb/A at Mt. Carmel compared to 6,455 lb/A at Windsor, a 12% difference. Compared to earlier fall crops at both sites, yield was substantially reduced as temperatures cooled and daylength shortened. Yield of Everest and Regal exceeded 8,000 lb/A at

both sites, somewhat below the national average. The quality of these cultivars was excellent with well-formed, medium sized heads. At Mt. Carmel, the heads of Everest were large enough to sell as a single unit but in all others bunching was required. At Mt. Carmel, yield was reduced by deer browse that damaged about 30% of the crop. At Windsor, yields of Olympus, Republic, and Superior were lowered because 30-50% of the plants failed to produce harvestable heads before a killing frost.

YIELD AND QUALITY OF CAULIFLOWER

Spring crops

In the first spring crop (transplanted late-April), the average yield of eight cultivars was 14,670 lb/A at Windsor and 8,500 lb/A at Mt. Carmel, a 72% difference. The greater yield at Windsor was due to greater curd weight (1.6 lb vs. 1.1 lb) and greater percent harvested (93 vs. 84). At Windsor, yield of seven of eight cultivars exceeded the 1993 national average of 12,100 lb/A for cauliflower (USDA 1994) compared to no cultivars at Mt. Carmel.

At Windsor, yield of Fremont, Incline, Starbrite Y, Star Dust, and Yukon exceeded 16,000 lb/A. Good quality was exhibited by Fremont and Siria whose dome-shaped curds averaged 1.7-1.9 lb. The curds of Fremont were well protected by wrapper leaves. Curd protection for Siria was fair and required tying of the outer leaves to ensure blanching. Early curds of Incline were well wrapped but late-developing curds were irregularly shaped with protruding small leaves. The semi-domed curds of Yukon were of fair quality with a lumpy appearance. Low yield of Majestic was caused by premature development of the curd while the plants were still small.

At Mt. Carmel, yield of Starbrite Y and White Passion exceeded 10,000 lb/A and were below the national average. The quality of these cultivars was good with their medium sized, semi-domed curds averaging 1.2 lb. The 1.0-1.1 lb curds of Fremont, Incline, Siria, and Star Dust were also of good quality. Curd cover of all these cultivars was fair and required tying to ensure blanching. Majestic developed small curds because of premature development.

In the second spring crop (transplanted mid-May), the average yield of 10 cultivars was 11,000 lb/A at Windsor and 5,790 lb/A at Mt. Carmel. At Windsor, five of 10 cultivars exceeded the national average, none at Mt. Carmel. Greater yield at Windsor was due to greater average curd weight (1.3 lb vs. 0.9 lb) and greater percent harvested (89 vs. 65). At Mt. Carmel, June drought impeded early plant growth, and small to medium curds formed in July.

At Windsor, Fremont had the greatest yield and its quality was excellent. Their dome-shaped curds were well protected from the sun. Yield of Minuteman, Siria, and Starbrite Y exceeded 13,000 lb/A. The curds of these cultivars were of good to fair quality. About 10% of curds of Minuteman

and Starbrite Y developed head rot and 10% of Siria's curds developed a pink tinge. The 1-lb curds of Star Dust had excellent cover for natural blanching.

At Mt. Carmel, the yield of Starbrite Y and White Passion exceeded 9,000 lb/A and were of good quality. The medium-sized curds of Fremont and Minuteman were of excellent quality and well protected by wrapper leaves for blanching. All other cultivars required tying. Over 50% of Star Dust, and Incline, late maturing cultivars, failed to produce marketable curds during the heat of July.

Fall crops

In the first fall crop (transplanted mid-July), the average yield of 10 cultivars was 18,715 lb/A at Windsor compared to 27,075 lb/A at Mt. Carmel, a 45% difference. Yield of all cultivars at both sites exceeded the national average of 12,100 lb/A. At Mt. Carmel, yields of eight of 10 cultivars were more than twice the national average.

At Windsor, yield of White Passion, Fremont, and Star Dust exceeded 20,000 lb/A. The quality of Fremont was excellent with dome-shaped curds well protected by wrapper leaves. Although the average curd weight of White Passion and Star Dust exceeded 2.0 lb, the curds were somewhat lumpy and of fair quality. The curds of Minuteman, Rushmore, and Siria also exceeded 2.0 lb and were of good quality with complete curd protection.

At Mt. Carmel, yield of Minuteman and Starbrite Y exceeded 28,000 lb/A. Curds of both cultivars were of excellent quality and well protected. The average curd weight of Fremont and Siria exceeded 3.0 lb and they were of excellent quality with good curd protection. Although the quality of Incline, Rushmore, Starbrite Y, Star Dust, and White Passion was also excellent, their wrapper leaves were less well developed, but their large, erect outer leaves enabled blanching of the curds.

In the second fall crop (transplanted early-August), the average yield of 10 cultivars was 17,730 lb/A at Windsor and 14,890 lb/A at Mt. Carmel, a 19% difference. Greater average curd weight (2.1 lb vs. 1.8 lb) accounted for the greater yield at Windsor compared to Mt. Carmel. Yield of eight of 10 cultivars at Windsor and seven of 10 cultivars at Mt. Carmel exceeded the national average.

At Windsor, yield of Minuteman and Rushmore exceeded 20,000 lb/A. Although their harvested curds averaged 2.3 lb and were of good quality, about 20% of Minuteman curds developed soft rot. Most cultivars in this planting displayed some degree of hollow stem, a symptom of boron deficiency. Yukon was most severely affected with 37% of curds splitting. Despite some hollow stems, curds of Fremont, Rushmore, Siria, and Star Dust were well protected by wrapper leaves and were of good quality.

At Mt. Carmel, yield of Minuteman and Fremont exceeded 18,000 lb/A. Their dome-shaped curds, weighing over 2.0 lb, were well protected by wrapper leaves and their

Table 7. Average maturity (days) of broccoli at Windsor and Mt. Carmel, Spring and Fall, 1995.

Cultivar	Harvest Midpoint		Harvest Span	
	Spring	Fall	Spring	Fall
FIRST CROP	4/30*	7/18*		
Arcadia	56	68	8	10
Eureka	56	75	8	12
Everest	52	59	8	11
Legacy	56	82	7	10
Liberty	56	74	8	8
Mariner	36**	67	2	7
Olympus	36**	68	2	10
Pinnacle	61	73	6	12
Regal	36**	57	1	9
Republic	55	76	10	10
Superior	46	78	6	8
SECOND CROP	5/16*	8/3*		
Arcadia	55	76	8	13
Eureka	55	76	9	13
Everest	52	63	9	11
Legacy	60	86	4	12
Liberty	55	80	6	10
Mariner	37**	70	7	11
Olympus	34**	73	5	11
Pinnacle	62	76	9	13
Regal	36**	57	7	9
Republic	55	76	8	12
Superior	46	78	8	12
THIRD CROP		8/24*		
Everest	-	68	-	7
Mariner	-	77	-	14
Olympus	-	74	-	10
Regal	-	69	-	8
Republic	-	82	-	8
Superior	-	82	-	6

*Average transplanting date between both sites.

**Buttoned (premature heading).

quality was excellent. Although their average curd weight was less, Rushmore and Siria were of excellent quality with good curd protection. Incline, Star Dust, and Yukon developed medium-sized, well protected curds with good quality. Early maturing curds of Starbrite Y and White Passion developed large, semi-domed curds but late-maturing curds were medium to small. The overall quality of these two cul-

tivars was fair because of the variability in curd size.

In the third fall crop (transplanted mid-August), Majestic was the only cultivar that produced harvestable curds at both sites. The yield at both sites was well below the national average. At Mt. Carmel, 63% of plants were damaged by deer browse. The harvested curds averaged 1.9 lb and were of fair quality. In this early-maturing cultivar, poorly devel-

Table 8. Average maturity (days) of cauliflower at Windsor and Mt. Carmel, Spring and Fall, 1995.

Cultivar	Harvest Midpoint		Harvest Span	
	Spring	Fall	Spring	Fall
FIRST CROP	4/30*	7/18*		
Fremont	64	80	10	12
Incline	68	94	12	15
Majestic	36**	64	5	7
Minuteman	-	80	-	10
Rushmore	-	86	-	12
Siria	62	86	10	12
Starbrite Y	60	86	12	10
Star Dust	64	91	10	11
White Passion	57	90	14	9
Yukon	64	92	6	10
SECOND CROP	5/16*	8/3*		
Fremont	61	89	8	11
Incline	65	100	5	12
Majestic	36**	69	1	7
Minuteman	52	86	12	13
Rushmore	53	94	12	11
Siria	54	90	9	15
Starbrite Y	56	87	12	16
Star Dust	65	97	5	12
White Passion	52	88	18	10
Yukon	65	96	8	10
THIRD CROP		8/24*		
Majestic	-	74	-	6

*Average transplanting date between both sites.

**Buttoned (premature heading).

oped wrapper leaves failed to provide curd protection. Fremont, Minuteman, and White Passion were also planted but they failed to produce harvestable curds as daylength and temperature declined in October.

MATURITY AND HARVEST SPAN

Knowing the time to produce a mature plant from seed or transplant allows the grower to schedule planting for harvest at a specific time. In Tables 7 and 8, the average days to maturity between Windsor and Mt. Carmel were calculated from the date of transplanting to the date when half of the heads were harvested, i.e. the harvest date of the 15th head from a population of 30 heads. The difference in maturity of

each cultivar between sites was seldom more than 4 days.

Maturity of broccoli

In the first and second spring crops, the range in maturity among all cultivars at both sites was 36-61 days (Avg. 49 days) and 34-62 days (Avg. 50 days), respectively (Table 7). Mariner, Olympus, and Regal, with maturities shorter than 40 days, produced small heads. In these early maturing cultivars, vernalization began early in the growth cycle and heads formed prematurely on small plants. In three plantings for fall harvest, the range in maturity among all cultivars at both sites was 57-82 days (Avg. 69 days), 57-86 days (Avg. 74 days), and 68-82 days (Avg. 75 days), respectively. Based on earlier studies (Hill 1995), it was practical to plant

only cultivars with early maturities to evaluate yield. Harvest was completed before killing frosts damaged the plants.

Maturity of cauliflower

In the first and second spring crops, the range in maturity among all cultivars at both sites was 36-68 days (Avg. 62 days) and 36-65 days (Avg. 58 days), respectively. The average maturity between the first and second crops decreased in response to increasing daylength and temperature. Majestic, with a maturity of 36 days in both crops, prematurely formed very small curds. In the second spring crop, 30-60% of Incline, a late-maturing cultivar, failed to form marketable curds at both sites in the heat of July.

In the first and second fall crops, the range in maturity among all cultivars at both sites was 64-94 days (Avg. 82 days) and 69-100 days (Avg. 90 days), respectively. In fall, average maturity increased in the second crop in response to decreasing daylength and temperature. Sufficient time was available to harvest all cultivars in the second fall crop even though late-maturing cultivars were subjected to early light frosts. Frost protection was provided by wrapper leaves tightly furled around the curd. In the third fall crop, the average maturity of Majestic, the only cultivar that produced marketable curds, was 72 days. Fremont, Minuteman, and White Passion were also planted but failed to produce marketable curds before a killing frost on November 6.

Harvest span

Another facet of maturity is the harvest span which I define as the days between harvest of 90% of a single cultivar. Single heads or curds that matured very early or very late in comparison to the whole population within a cultivar were excluded. Short harvest spans favor a single harvest by hand or machine. Longer harvest spans require multiple pickings and may be preferred by growers for roadside sales. In general, hybrid cultivars have greater genetic uniformity, and maturity is more closely controlled. Open pollinated cultivars have greater diversity in maturity and tend to have longer harvest spans. The harvest spans of many cultivars were observed to be shorter in spring crops than in fall crops. For example, the average harvest span for spring crops of broccoli was 5-7 days compared to 10-12 days for the first two fall crops (Table 7). The average harvest span decreased to 9 days in the third fall crop because the final heads were harvested before they reached full maturity on threat of a killing frost. As daylength and temperature decreased, growth of individual plants decreased and maturity became more diverse.

In spring, Mariner, Olympus, and Regal had the shortest harvest spans because they formed heads prematurely and were all harvested within 2-7 days. In fall, Regal and Liberty had 7-10-day spans. A single harvest at the midpoint of the span would have included about 50% slightly immature heads.

For cauliflower, Majestic and Star Dust had relatively short harvest spans in spring and fall compared to others.

MANAGEMENT

Selection of cultivars

As a group, the new broccoli cultivars, released since 1988, have been bred for dome-shaped heads which shed water to lessen the probability of head rot. Many new cultivars have heads which rise above the main canopy of leaves to facilitate harvest with a minimum of trimming. Those with excellent yield and consistent quality are listed in Table 9 with their appropriate planting times.

The 1995 trials demonstrated that several new cultivars of broccoli and cauliflower, released since 1988, have desirable yield and quality characteristics that are consistent with profitable commercial production and enjoyment by home gardeners in Connecticut. These new cultivars can be added to those reported earlier (Hill 1989) for broccoli: Premium Crop, Green Comet, Symphony, Packman, Cruiser, Emperor, and Green Valiant and for cauliflower: Andes, Polar Express, White Knight, White Rock, White Fox, Taipan, Candid Charm, and Snow King.

Planting strategies can be developed to satisfy objectives for a single harvest to supply a supermarket chain or multiple harvests to maintain a daily supply for retail at roadside stands. For single harvests, cultivars with harvest spans of a week or less are desirable. Among the broccoli cultivars tested in spring, Everest, Eureka, and Arcadia seem to be the best choices if transplanted by early-May. Their harvest spans in spring plantings in 1993-1994 were a few days less than those reported for 1995 (Hill 1995). In fall, Regal and Mariner had the shortest harvest spans, 7-9 days and are candidates for single crop harvests if transplanted in mid-July.

Among the cultivars tested in spring 1995, none had harvest spans lasting more than 2 weeks, thus multiple pickings would be confined to this period. In fall, multiple harvests lasting more than 10 days were provided by Eureka and Pinnacle when transplanted by mid-July and by Eureka, Everest, Pinnacle, and Republic when planted by early-August.

Multiple harvests in spring are best supplied by single plantings of cultivars with different maturities. Everest planted with Eureka or Arcadia provided a 14-day harvest span. Two plantings of the same cultivars, 2 weeks apart, provided a 4-week harvest span. With a similar combination of cultivars with different maturities, Everest, Olympus, or Regal combined with Eureka, Pinnacle, or Republic provided a 3-week span. Two plantings, 2 weeks apart, of any combination of these cultivars provided a 6-week span. Everest and Regal, planted in mid-August, provided a 7-8-day harvest span in late-October or early November in areas where early frosts are not severe.

For ease of harvest, Everest and Pinnacle were satisfac-

Table 9. Selection of cultivars with uniform yield and quality of broccoli and cauliflower for transplanting at specific times during the growing season.

	Late April- Early May	Mid-May	Mid-July	Early Aug.	Mid-Aug.
Broccoli	Everest Eureka Arcadia	Everest Eureka Arcadia	Everest Eureka Pinnacle Mariner Olympus Regal Republic** Arcadia	Everest Eureka Pinnacle Olympus Regal Republic** Arcadia	Everest Regal*
Cauliflower	Fremont Minuteman	Fremont Minuteman	Fremont Minuteman Rushmore Incline Siria Star Dust	Fremont Minuteman Rushmore Incline Siria Star Dust	Majestic

*Suitable for bunching.

**Thick stalk, suitable for crown cuts.

tory choices. Their heads were well exerted above the main canopy of foliage and leaves along the upper portion of stalk were few. Although the cut heads of these cultivars are easy to trim, they do not provide sprouts for second harvest. The heads of Arcadia, Eureka, and Mariner, were well developed, but prominent leaves along the upper portion of stalk were trimmed with moderate effort. These cultivars also provided abundant side shoots for second harvest with bunching. Republic had a large domed head but its excessively thick stalk would probably limit its harvest to a crown cut.

For cauliflower, choices are fewer. In spring, Fremont and Minuteman had curds of excellent quality. At Mt. Carmel, their average harvest span was 8-12 days but at Windsor only 4 days. Their use as a single harvest crop seems quite good in the Connecticut Valley. A multiple planting of both cultivars, 2 weeks apart, provided a 3-week harvest span in spring. In fall, a single planting of Fremont, Minuteman, Rushmore, Incline, Siria, or Star Dust provided a 10-15-day harvest span. Multiple plantings, 2 weeks apart, of Fremont or Minuteman with Siria, Rushmore, Star Dust, or Incline provided a harvest span of 7 weeks with a break of 10 days between the last harvest of the first fall crop and the first harvest of the second fall crop.

In choosing the best cultivars to use for a specific planting, there are a few general rules to consider based on observations. For April transplanting of broccoli and cauliflower, cultivars with early maturities never produced

greater yields than those with mid-to-late maturities. For mid-May transplanting, cultivars with late maturities are more prone to head deformity due to summer heat than cultivars with early-to-mid maturities. In fall, most cultivars transplanted in mid-July through early-August produced satisfactory yields irrespective of maturity. For transplanting in mid-August, only broccoli cultivars with early-to-mid maturities produced satisfactory yields. For cauliflower, only cultivars with early maturities produced satisfactory yield. Those with mid-to-late maturities did not produce harvestable curds before frost damaged the crop.

Most cauliflower cultivars, transplanted in spring, required tying of the outer leaves to ensure blanching of the curds. The wrapper leaves of some self-blanching cultivars often do not completely envelop the rapidly growing curds. By October 1, the curds of most cultivars transplanted for fall harvest had satisfactory protection by wrapper leaves which blanched the curds and protected them from early frosts.

Transplanting dates

In the Connecticut Valley and along the shoreline, transplanting between April 20 and May 15 was successful for all cultivars except those with early maturities. Those should be planted after May 1. In the Eastern and Western Highlands, where air and soil temperatures rise more slowly, transplanting of most cultivars should be delayed until May 1. At this time there is still a 1 in 10 chance of a late spring frost

(Brumbach 1965). In cooler areas of the state, transplanting should be completed by May 20.

In fall, transplanting can begin July 15 and continue through August 15 in the Connecticut River Valley and along the shoreline. Cultivars with late maturities failed to reach marketable size when planted after August 15. In cooler areas of the Eastern and Western Highlands, transplanting of all cultivars should be completed by August 1.

Spring seeding for production of transplants in the greenhouse began 6 weeks before the transplanting date to allow sufficient time to produce 4-5-inch plants, hardened in a coldframe. Fall seeding for mid-July transplanting began 4 weeks before the transplanting date and 5 weeks before August transplanting dates.

COMPENDIUM 1993-1994

Broccoli and cauliflower trials were established to identify new cultivar releases that are best suited to Connecticut's soil and climate. Broccoli and cauliflower cultivars that yielded well with good quality were repeated in 1994 and 1995 and new cultivars were added each year to the trials. During the trials, the cultivars were subjected to droughts (1993, 1994, and 1995 especially in spring at Mt. Carmel) and above normal temperatures in June and July (1994 and 1995). These vagaries in weather affected crop yield. It should be noted that the most promising cultivars identified in this compendium are reliable but not infallible due to weather extremes not encountered during the trial period. Cultivars dropped from testing because of poor yield or quality may have been treated too harshly, but it was impractical to test all 25 cultivars of broccoli and 16 cultivars of cauliflower each year to determine their true probability of success. Some cultivars tested late in the program may have had insufficient time to test their performance under varying weather.

Table 10 lists the yields of all cultivars tested in 1993-1995. Additional details of their quality, and maturity may be found in this Bulletin and in Bulletin 930 of this Station. The most reliable cultivars will now be described in some detail.

Spring and fall plantings—broccoli

- *Everest* was tested for 3 years. Heads were semi-dome shaped, 6-8 inches diameter, and well exerted above the canopy of leaves. The average head weighed 1.4 lb in spring and 1.3 lb in fall. The upper stalk has a few small leaves that are easy to trim. Its potential for a second harvest of sprouts was negligible. Its planting range was April 20-May 15 and July 15-August 15 with an average maturity of 50 days in spring and 61 days in fall. Its harvest span averaged 8 days in spring and 14 days in fall. This cultivar was fairly well

suited for machine harvest in spring.

- *Eureka* was tested for 3 years. Heads were compact, dome shaped, 7-8 inches diameter, and well exerted above the leaf canopy. The average head weighed 1.6 lb in spring and 1.3 lb in fall. The upper stalk has more prominent leaves than Everest but were trimmed with moderate effort. Its potential for second harvest of sprouts is good in the first spring and fall plantings. Its planting range was April 20-May 15 and July 15-August 1 with an average maturity of 56 days in spring and 77 days in fall. Its harvest span averaged 8 days in spring and 14 days in fall. This cultivar was well suited for multiple harvests for roadside sales especially in fall.

- *Arcadia* was tested for 3 years. Heads were compact, dome shaped, 6-7 inches diameter, and well exerted above the leaf canopy. The average head weighed 1.6 lb in spring and 1.3 lb in fall. The upper stalk had prominent leaves but were trimmed with moderate effort. Its potential for second harvest of sprouts was excellent in the first spring and fall plantings. Its planting range was April 20-May 15 and July 15-August 1 with average maturity of 57 days in spring and 75 days in fall. Its harvest span was 6 days in spring and 13 days in fall. This cultivar was well suited for multiple harvests in fall for roadside sales. Arcadia was sensitive to boron deficiency in sandy soil and would benefit from boron applications to minimize corky stem.

- *Emerald City* was tested for 2 years. The heads were semi-dome shaped, 6-8 inches diameter, and well exerted above the leaf canopy. The average head weighed 1.4 lb in spring and 1.3 lb in fall. The upper stalk had a few small leaves that were easily trimmed. Its potential for second harvest of sprouts was good for the first spring and fall plantings. Its planting range was May 1-15 and July 15-Aug 1 with an average maturity of 47 days in spring and 63 days in fall. Its harvest span was 7 days in spring and 14 days in fall. This cultivar was fairly well suited for a single harvest in spring and well suited for multiple harvests in fall for roadside sales. Its quality in late-April plantings was limited by uneven maturation of individual florettes within the head (cat's eye) and in mid-August plantings by uneven growth of the head.

- *Barbados* was tested for 2 years. The heads were compact, semi-dome shaped, 4-7 inches diameter, and well exerted above the leaf canopy. The average head weighed 0.9 lb in spring and 1.1 lb in fall. The upper stalks were thinner than most cultivars tested and contained few leaves that were easily trimmed. Its potential for second harvest of sprouts was poor. In spring, about 50% of heads were 4-5 inches diameter and were suitable for bunching. Larger heads could be retailed as single units. Its planting range was April 20-May 15 and mid-July with an average maturity of 44 days in spring and 63 days in fall. Harvest span was 6 days in spring and 10 days in fall. This cultivar was well

Table 10. Three-year compendium of yields (T/A) of broccoli and cauliflower grown at Windsor and Mt. Carmel, 1993-1995. Yields are averages of 2 spring crops and 2 fall crops at each site.

Cultivar	WINDSOR						MT. CARMEL					
	1993		1994		1995		1993		1994		1995	
	Spr.	Fall	Spr.	Fall	Spr.	Fall	Spr.	Fall	Spr.	Fall	Spr.	Fall
BROCCOLI												
Arcadia	7.0	5.4	8.9	6.7	7.4	4.9	6.5	5.6	6.8	5.4	6.2	7.4
Barbados	4.2	4.6	5.0	5.6	-	-	5.0	5.0	4.0	4.9	-	-
Baron	-	-	3.0	5.0	-	-	-	-	2.5	4.8	-	-
Big Sur	3.4	5.3	-	-	-	-	2.5	5.7	-	-	-	-
Brigadier	3.2	4.7	-	-	-	-	4.3	5.0	-	-	-	-
Emerald City	6.8	5.2	6.5	6.5	-	-	6.8	6.1	6.1	5.5	-	-
Eureka	8.1	4.9	8.2	6.4	7.8	5.1	5.5	6.0	7.6	4.5	6.7	7.3
Everest	6.5	6.3	6.8	5.8	6.1	5.3	7.5	5.9	7.2	4.7	5.2	7.1
FMX-144	-	-	3.5	5.2	-	-	-	-	3.5	4.5	-	-
Galleon	1.5	4.2	-	-	-	-	0.7	5.0	-	-	-	-
Legacy	-	-	-	-	8.6	7.5	-	-	-	-	5.4	9.7
Legend	6.4	3.9	3.8	5.7	-	-	6.3	5.6	5.3	4.6	-	-
Leprechaun	3.3	3.8	-	-	-	-	2.0	4.7	-	-	-	-
Liberty	-	-	-	-	7.9	6.3	-	-	-	-	7.0	9.3
Mariner	5.1	3.1	5.2	5.3	4.0	5.3	6.0	5.1	4.3	5.8	2.0	6.7
Marathon	8.9	4.8	-	-	-	-	8.8	5.3	-	-	-	-
Ninja	4.5	5.3	-	-	-	-	5.1	4.9	-	-	-	-
Olympus	-	-	-	-	3.8	5.4	-	-	-	-	1.9	8.2
Pinnacle	6.8	6.2	6.2	6.7	7.1	5.2	4.5	5.9	4.5	5.9	4.6	7.0
Regal	-	-	-	-	3.5	4.8	-	-	-	-	2.0	6.8
Republic	-	-	-	-	6.7	6.4	-	-	-	-	6.4	9.3
Sprinter	3.8	5.1	3.4	4.6	-	-	4.5	4.6	3.5	3.3	-	-
Sultan	5.2	5.2	-	-	-	-	5.4	4.2	-	-	-	-
Super Dome	7.9	3.8	-	-	-	-	6.5	4.7	-	-	-	-
Superior	-	-	-	-	5.9	4.5	-	-	-	-	3.7	6.8
CAULIFLOWER												
Amazing	-	-	6.1	5.1	-	-	-	-	4.8	4.7	-	-
Cashmere	-	-	6.1	9.4	-	-	-	-	5.7	7.8	-	-
Fremont	-	-	7.0	10.0	7.9	9.7	-	-	6.4	7.8	4.5	11.5
Incline	-	-	2.4	9.6	5.6	8.8	-	-	2.0	7.0	2.5	8.3
Majestic	-	-	-	-	3.0	5.5	-	-	-	-	1.6	10.4
Minuteman	-	-	-	-	6.6	10.0	-	-	-	-	4.1	12.9
Rushmore	-	-	6.2	10.4	6.5	10.2	-	-	5.2	7.2	4.5	10.8
Serrano	-	-	5.9	9.0	-	-	-	-	6.2	7.5	-	-
Sierra Nevada	-	-	3.1	5.8	-	-	-	-	3.7	4.3	-	-
Siria	-	-	5.1	8.8	6.6	9.5	-	-	5.1	6.0	4.4	9.4
Solide	-	-	4.2	5.8	-	-	-	-	3.8	5.1	-	-
Starbrite Y	-	-	-	-	7.4	9.4	-	-	-	-	5.3	10.6
Star Dust	-	-	-	-	6.6	8.9	-	-	-	-	3.1	10.1
White Bishop	-	-	3.3	7.1	-	-	-	-	4.0	6.3	-	-
White Passion	-	-	-	-	6.4	10.3	-	-	-	-	4.8	10.9
Yukon	-	-	-	-	6.7	7.5	-	-	-	-	3.2	9.9

suited for machine harvest in spring. Its quality in August plantings was limited by variable head size. Its greatest virtue was tenderness of the stalk. Woody fibers did not develop beneath the epidermis, a characteristic of many early-maturing cultivars.

Fall plantings—broccoli

- *Pinnacle* was tested for 3 years. Heads were dome shaped, 6-7 inches diameter, and well exerted above the leaf canopy. The average head weighed 1.3 lb in fall. The upper stalk had few leaves that were easily trimmed. Its potential for second harvest of sprouts was fair. Its planting range was July 15-August 1 with an average maturity of 77 days. Its harvest span averaged 10 days in fall. This cultivar was fairly well suited for multiple harvests for roadside sales. Although yield in spring was greater than in fall, the quality of some heads was limited by uneven head formation and random browning of individual flower buds at maturation (brown beading).

- *Mariner* was tested for 3 years. Heads were dome shaped, 5-7 inches diameter, and slightly exerted above the leaf canopy. The average head weighed 1.2 lb in fall. The upper stalk contained leaves more closely spaced than cultivars with more exerted heads, but they were trimmed with moderate effort. Its potential for second harvest of sprouts was good for mid-July plantings and fair for early-August plantings. Its planting range was July 15-August 1 with average maturity of 68 days in fall. Its harvest span averaged 11 days. This cultivar was fairly well suited for multiple harvests for roadside sales. Its quality in spring was mixed with variable yield. Some early plantings in spring formed heads prematurely with low yield.

- *Olympus* was tested for 1 year. Heads were dome shaped, 6-8 inches diameter, and slightly exerted. The average head weighed 1.4 lb in fall. The upper stalk contained few leaves that were easily trimmed. Its potential for second harvest of sprouts was fair for mid-July plantings. Its planting range was July 15-August 1 with an average maturity of 70 days. Its harvest span averaged 11 days. This cultivar was fairly well suited for multiple harvests for roadside sales. Its quality in spring was limited by premature heading with small to medium size heads.

- *Regal*, an early maturing cultivar, was tested for 1 year. Heads were semi-dome shaped, 6-7 inches diameter, and slightly exerted. The average head weighed 1.2 lb. The upper stalk had fairly prominent leaves but were easily trimmed. Its potential for second harvest of sprouts was fair for mid-July plantings. Its planting range was July 15-August 15 with an average maturity of 57 days for mid-July to early-August plantings and 69 days for mid-August plantings. Its harvest span averaged 9 days. This cultivar was fairly well suited for multiple harvests for roadside sales. Its quality in spring was limited by premature heading

with small to medium size heads.

- *Republic* was tested for 1 year. Heads were compact, dome shaped, 6-8 inches diameter, and slightly exerted. The average head weighed 1.7 lb in fall. The upper stalk was somewhat thick and contained closely spaced leaves which were more difficult to trim than cultivars with more exerted heads. Its potential for second harvest of sprouts was fair for mid-July plantings. Its planting range was July 15-August 1 with an average maturity of 76 days. Its harvest span was 11 days. This cultivar was fairly well suited for multiple harvest. Harvest as crown cuts would eliminate trimming costs. Its quality in spring was limited by uneven head growth and development of brown beads in late-maturing heads.

Spring and fall plantings—cauliflower

- *Fremont* was tested for 2 years. The curds were high dome shaped, compact, 6-8 inches diameter, and well protected in spring and fall by wrapper leaves for blanching. The average curd weighed 1.4 lb in spring and 2.2 lb in fall. Its planting range was April 20-May 15 and July 15-August 1 with an average maturity of 59 days in spring and 84 days in fall. Its harvest span averaged 8 days in spring and 12 days in fall. This cultivar was well suited for multiple harvests for roadside sales in fall. A single harvest in spring would require grading for size.

- *Minuteman* was tested for 1 year. The curds were dome shaped, compact, 6-8 inches diameter, and well protected by inner wrapper leaves for blanching. The average curd weighed 1.5 lb in spring and 2.7 lb in fall. Its planting range was April 20-May 15 and July 15-August 1 with an average maturity of 52 days in spring and 83 days in fall. Its harvest span averaged 12 days in spring and fall. This cultivar was well suited for multiple harvests in both seasons for roadside sales. Single harvests in spring or fall would require grading for size.

Fall plantings—cauliflower

- *Rushmore* was tested for 2 years. The curds were dome shaped, compact, 6-8 inches diameter, and well protected by inner wrapper leaves for blanching. The average curd weighed 2.1 lb in fall. Its planting range was July 15-August 1 with an average maturity of 83 days. Its harvest span averaged 14 days. This cultivar was well suited for multiple harvests for roadside sales. Single harvests would require grading for size. Its quality in spring was fair to good but rapid curd growth in July outpaced the growth of wrapper leaves and tying of outer leaves was needed for blanching. Growth of curds in spring became somewhat uneven but their harvest for florettes was possible.

- *Incline*, a late maturing cultivar, was tested for 2 years. The curds were dome shaped, compact, 6-8 inches diameter, and well protected by inner wrapper leaves for blanching.

The average curd weighed 2.1 lb in fall. Its planting range was July 15-August 1 with an average maturity of 95 days in fall. Its harvest span averaged 17 days. This cultivar was well suited for multiple harvests for roadside sales. The variability in growth rates for individual curds precludes a single harvest. In spring, the quality was poor. Because of its late maturity, many plants failed to form curds or were misshapen with leaves protruding the curd during hot July temperatures.

- *Siria* was tested for 2 years. The curds were dome shaped, compact, 6-8 inches diameter, and well protected by inner wrapper leaves for blanching. The average curd weighed 2.1 lb in fall. Its planting range was July 15-August 1 with an average maturity of 86 days. Its harvest span was 14 days. This cultivar was suitable for multiple harvests for roadside sales. Single harvests in fall would require grading for size. In spring, quality was fair and limited by uneven growth of some curds and the requirement of tying the outer leaves for blanching.

- *Star Dust*, a late-maturing cultivar, was tested for 1 year. The curds were semi-dome shaped, compact, 7-8 inches diameter, and well protected by inner wrapper leaves for blanching. The average curd weighed 2.2 lb in fall. Its planting range was July 15-August 1 with an average maturity of 94 days. Its harvest span was 12 days. This cultivar was well suited for multiple harvests for roadside sales. Single harvests would require grading for size. In spring, quality for late-April plantings was good. For mid-May plantings, its late maturity prevented the curds from reaching marketable size.

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